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ABSTRACT

In a study of the personalities of preservice teachers, Cattell's 16 Personality Factor (PF) Questionnaire was administered to 2,225 applicants to the College of Education of the University of Akron (Ohio). Data were analyzed by gender and by year of application (Year 1, 2, or 3). Results indicated that at the primary factor level, personality factors were found to be stable across time and gender. Results of discriminant analysis revealed statistically significant differences in the primary factor profiles between males and females, but further analysis determined that the differences were not practically significant. Data were analyzed for specific personality traits, such as anxiety, independence, extraversion, superego strength, imaginativeness, and uncontrolled imaginativeness and found to be very similar across time and gender. These results support the use of a single factor structure for both genders. The paper concludes that men and women applying to the teacher education program share similar personality structures, and the personalities of cohorts of preservice teachers appear to be stable from year to year. (Contains 73 references.) (JDD)

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THE PERSONALITY STRUCTURE OF PRE-SERVICE TEACHERS AS MEASURED BY THE 16 PF: ESTIMATES OF STABILITY ACROSS TIME AND GENDER

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ABSTRACT

Past personality research includes the investigation of the personality structure of in-service teachers and the relationship between personality and occupational teaching success. However, little has yet been done in investigating the personalities of pre-service teachers. A better understanding of this population would be of assistance in the selection, advising, and counseling of future teachers. Also, review of the literature suggests both disagreement as to the nature and number of 16 PF second-order factors, and the existence of gender differences in personality. Therefore, Cattell's 16 PF was administered to 2,225 male and female pre-service teachers over a three year period.

Results indicated that at the primary factor level, personality factors were found to be stable across time and gender. Factor analyses were performed on all five samples (Year 1, Year 2, Year 3, Males, and Females) and results of the Kaiser Factor Matching and canonical correlations (redundancy indexes) indicated nearly identical factor structures for all groups and the stability of the second-order factor structure of the 16 PF across time and gender.

A number of implications of the study were discussed. First, results indicated it is appropriate to

use a common primary factor profile for male and female pre-service. Second, the findings of nearly identical second-order factor structures for men and women is consistent with the findings of Krug and Johns (1986) and Miller and Krieshok (1989). The study's results support the use of the second-order factors in research, and the development of common factor profiles and equations. Lastly, the utilization of the pre-service personality data in conducting correlational studies and in advising of students is encouraged.

Educators have sought to use knowledge of personality to assist them in their jobs. For example, Benton and Richardson (1990) comment that assessment of personality factors of prospective teachers can determine if certain personality characteristics predispose some individuals to succeed or fail in student teaching programs. Fortunately, there is mounting evidence which suggests that personality variables are related to successful teaching behaviors (Feldman, 1986; Lee, Byrne, & Lee, 1990; Marso & Pigge, 1991; Morgan, 1984; Murray, 1975; Peters, 1985; Schmidt, 1989; Soh, 1988; Young, 1990). In fact, many researcher-educators argue that personality assessment should be an essential component of teacher-preparation programs and in selecting future teachers (Baldwin, Slaton, Head, & Burns, 1990; Cureton & Cook, 1990; Payne & Manning, 1985). For example, Shechtman (1989) believes that evaluations of candidates for teacher education programs should include the use of tools designed to assess interpersonal skills, such as Cattell's Sixteen Personality Factor Questionnaire (16 PF). Finally, Cattell (1973) suggests that

> [a] different but important role of personality in the school has been investigated in connection with effects of the teacher's personality. The criterion is frequently a practicable rating rather than an ideally objective evaluation of change in pupils, but the results are reasonably consistent in showing success with affectia *A*, superego strength *G*, parmia *H*, self-sentiment *Q3*, and sometimes ergic tension *Q4* and intelligence *B*. (p. 448)

Personality instruments commonly employed in education include the Minnesota Multiphasic Inventory (MMPI), the Myers Briggs Type Indicator (MBTI), California Personality Inventory (CPI), Edward's Personal Preference Survey (EPPS), the Omnibus, and the 16 PF. Typically, many have used these instruments to examine the relationship between selected components of personality and various criterion variables, such as success in academics and success in teaching (see Ferris, Bergin, & Wayne, 1988; Hart & Driver, 1978; Kegel-Flom, 1983; Mathiasen, 1984; Soh, 1988; Schuerger & Kuna, 1987). Unfortunately, much of this research has been content to isolate and study only selected components of personality, not the entire personality. Further, little is known about the personality structures of "pre-service" teachers. Finally, many studies have not employed personality instruments with established norms, validity, and reliability (Cattell, 1973).

What is needed, therefore, is a standard instrument which measures personality in general and which has long established validity and reliability. Also, the instrument should have known relationships to other assessment instruments of interest and be capable of not only measuring pathological personalities, but also normal personalities. That is, there is a need for an instrument which can be used for career counseling/advising of pre-service teachers, to decide who is likely to be effective in teaching.

Because of these reasons, a variety of instruments were investigated by this researcher. It appears that the 16 PF meets many of the needs addressed above better than other instruments on the market, and is perhaps the most widely utilized instrument of personality investigators (Leach, 1991; Zuckerman, 1985). For example, Furnham (1991) comments that the test "that has been most extensively and systematically used to predict (i.e., correlate with) occupation success has been Cattell's 16 PF" (p. 87); while other instruments commonly employed in higher education have been found to be deficient (e.g., the Omnibus - see Schuerger & Allen, 1986; the MMPI and the EPPS - see Cattell, 1973). Additionally, Miller and Krieshok comment that the "16 PF is a well-established, objective measure of normal personality used in research, counseling, educational placement, and personnel selection" (p. 73). Cattell (1973) concludes that

> a total of 50 percent of the observed achievement variance...can in most situations be predicted from the intelligence factor *B* and the personality primaries, all conveniently brought together in a single questionnaire format in the 16 PF. (p. 442)

However, the view of the literature is somewhat skimpy on the use of the 16 PF with pre-service teachers. Therefore, this is one of a series of studies in which the 16 PF is going to be investigated with pre-service teachers.

One of the key questions concerning the 16 PF has to do with how stable the factors are for this population.

That is, it is apparent that before it can be used for diagnostic and predictive purposes, one must first have estimates of the 16 PF's factor structure stability for the population of interest. In other words, the instrument must demonstrate that it has stable constructs across time (years) and gender. This was the major intent of this research.

There is some precedent-setting research in regards to the stability of the 16 PF across gender. Cattell (1973) states,

> highly significant differences in the mean level (not the pattern) on both the primaries and secondaries were first discovered and clearly recorded on the 16 PF in the 1961 edition...[and] it has been shown that the sex differences continue with considerable consistency throughout the age ranges. (p.324)

More recently, the gender stability of the 16 PF's second order factors was investigated. Miller and Krieshok (1989) determined that the second-order factor structures for men and women were essentially the same and that all the secondary traits should be estimated with a common formula. However, since the resulting secondary traits correlated differently with each other for men and women, their interpretation and usages should be done separately by gender. These researchers comment that this should be done as long as "(a) the relationships among the traits are not the same for men and women and (b) there are potential mean differences or differences in norms for the men and women" (p.78). Additionally, Krug and Johns' (1986) research led

them to conclude that for three of five second-order factors, a common equation for males and females is "theoretically and practically justifiable" (p. 691).

Therefore, additional evidence as to the stability of the factor structure of the 16 PF will play an important step in developing normative data for this special population. That is, it will help to establish a personality bench mark or baseline for pre-service teachers. Such a profile will permit two things: It will allow comparisons of this group with other pre-service groups; and it will facilitate research on the relationship between pre-service teachers' personality and their present and future performances. Additionally, stability information is necessary in order to use this instrument for counseling/advising of pre-service teachers, selection of pre-service teachers, decision making, and curriculum development.

In summary, the present research was undertaken for three purposes: (a) to determine if there are group differences at the primary factor level (i.e., differences between males and females, and between Year 1, Year 2, and Year 3); (b) to develop normative personality data for pre-service teachers; and (c) to investigate the invariance of the second-order factor structure of the 16 PF across time and gender for pre-service teachers.

METHOD

Subjects

All subjects for this study were individuals who applied to the University's College of Education, and were required to take the 16 PF as a requirement of admission. Two thousand two hundred and twenty-five subjects (N=2,225) were used for this investigation. The subjects were divided twice, with the divisions being independent of each other. First, they were divided into two groups: males (N=568) and females (N=1,657); and second, they were divided into three groups: students applying for admission in Year 1 (N=780), Year 2 (N=1,015), and Year 3 (N=430).

Instrument

Data from Form A of Cattell's 16 PF were used for this study. The only additional information added to each subject's 16 primary scale scores was the subject's gender.

Procedures

First, discriminant analyses were calculated to determine if there were differences in the primary factor profiles between the groups. Second, analyses of covariance were run in order to determine where group differences in the factor profiles were occurring. Next, means and standard deviations of the 16 PF scores were calculated.

These descriptive data were used to develop normative information on pre-service teachers' personalities and as a means of comparison with existing 16 PF norms. Fourth, factor analytic techniques were used to determine the underlying secondary factor structure of the 16 PF. Fifth, Kaiser Factor Matching was used to compare the second-order factor structures of males and females, and Year 1, Year 2, and Year 3. Finally, canonical correlations were run and redundancy estimates were calculated to determine the amount of shared factor space between the various factor solutions.

RESULTS

The results of this study are divided into four sections: (1) Primary factor differences (i.e., differences between males and females, and between Year 1, Year 2, and Year 3); (2) norm data; (3) the factor stability of the second-order factor structure of the 16 PF across time; and (4) the factor stability of the second-order factor structure of the 16 PF across gender.

Primary Factor Differences

Discriminant analyses were run to test for significant differences in the 16 PF's primary factors between pre-service teachers entering the College of Education in Year 1, Year 2, and Year 3. The predictor variables in all discriminant regression equations consisted of the 16 primary factors (A, B, C, E, F, G, H, I, L, M, N, O, Q1, Q2, Q3, Q4). The criterion variable in each equation was entitled "Year" and consisted of the following dichotomous pairings:

- Discriminant Analysis 1: Year 1 and Year 2
- Discriminant Analysis 2: Year 1 and Year 3
- Discriminant Analysis 3: Year 2 and Year 3

Results for all three discriminant analyses were nonsignificant:

- Discriminant Analysis 1: $F=1.355$; $R^2=.0120$; $p>.15$

- Discriminant Analysis 2: $F=1.083$; $R^2=.0143$; $p>.36$
- Discriminant Analysis 3: $F=0.816$; $R^2=.0091$; $p>.66$

In other words, it was found that there were no significant differences in the primary factor profiles between Years 1, 2, & 3. Consequently, it was unnecessary to run analyses of covariance to determine where differences existed.

Discriminant analyses were run to test for significant differences in the 16 PF's primary factors between male and female pre-service teachers. The 16 primary factors (A, B, C, E, F, G, H, I, L, M, N, O, Q1, Q2, Q3, Q4) were used as the predictor variables and gender was used as the dichotomous criterion variable.

Results of the discriminant analysis were significant for gender: $F=12.226$; $R^2=.0814$; $p<.0001$. In other words, it was found that there were significant differences in the primary factor profiles between males and females.

Since the discriminant analysis indicated that gender differences existed, it was necessary to subject the data to further analysis to determine where the differences were occurring. A series of analyses of covariance (ANCOVAs) were run and it was found that 10 of the 16 predictor variables were statistically significant at the .01 level: E, F, H, I, L, M, O, Q1, Q3, and Q4. As can be seen in the table below (Table 1), variables I and Q1

accounted for over 1% of the variance in gender (.0104 and .0164, respectively).

Table 1

Analyses of Covariance for Males and Females

Var.	R^2	alpha	F	P	Sig.
E	.0039	.01	9.458	.0021	S
F	.0069	.01	16.509	.0001	S
H	.0072	.01	17.305	.0001	S
I	.0104	.01	24.981	.0001	S
L	.0068	.01	16.220	.0001	S
M	.0057	.01	13.726	.0002	S
O	.0072	.01	17.381	.0001	S
Q1	.0164	.01	39.326	.0001	S
Q3	.0050	.01	12.005	.0005	S
Q4	.0045	.01	10.753	.0001	S

While these variables were statistically significant (expected with large N-sizes), it was necessary to determine their practical significance. Effect size was used as a criterion of significance (Bobner & Newman, 1982). Using a small effect size, $f^2=.02$ (Cohen, 1977; Newman & Benz, 1979), the following minimum R^2 was determined using Bobner and Newman's (1982) equation:

$$R^2 = \frac{f^2}{1 + f^2} = \frac{.02}{1 + .02} = .0196$$

Evaluating the obtained R^2 against the critical R^2 (.0196), it was found that none of the 10 variables was **practically** significant.

Norm Data (Means and Standard Deviations)

As a result of the nonsignificant results obtained for the primary factors across time, it was deemed acceptable to aggregate the means and standard deviations for males and females across all three years. Table 2 presents the norm data for female and male pre-service teachers (over Years 1, 2, and 3). It should be noted that while there appeared to be only insignificant differences in the primary factor profiles for males and females, the normative data is reported separately by gender since mean differences may still exist in the factor scores. The values reported are sten scores ("standard ten") which are distributed over 10 equal-interval score points, from 1 to 10.

Table 2

Norm Data for Pre-service Teachers

Variable	Female Mean	Female Std.Dev	Male Mean	Male Std.Dev
A	6.0308	1.8973	6.0089	1.8368
B	6.0477	1.9062	6.2729	1.9358
C	6.6681	1.9630	6.6056	1.9152
E	5.7411	1.7604	5.8363	1.9625
F	6.2342	2.0215	6.3574	1.9164
G	6.3603	1.8204	6.3239	1.8423
H	7.0754	2.0305	6.7641	2.0308
I	6.0054	1.8259	6.5792	1.9887
L	5.3832	1.9164	5.0633	1.9216
M	4.4140	1.8546	4.8785	1.9357
N	5.8594	2.0106	5.9383	2.0249
O	4.7435	2.1210	4.5317	1.8628
Q1	5.1346	1.8206	4.6074	1.8399
Q2	5.4882	1.8151	5.7676	1.9205
Q3	7.1436	1.9145	6.7676	1.9260
Q4	4.6620	2.1140	4.9665	2.1726

Factor Stability: Years 1, 2, and 3

In order to discuss the results of the investigation of differences in the second-order factor structure of the 16 PF between pre-service teachers entering the College of

Education in Year 1, Year 2, and Year 3, it is first necessary to discuss the results of the second-order factor analysis for these groups.

Factor Structure of Year 1 Sample. The factor loadings for the Varimax solution of the principal component method of factor analysis for pre-service teachers applying to the College in Year 1 are presented in Table 3. Using an eigenvalue of less than 1 as the criterion to stop factoring, four factors were extracted which accounted for 51.96% of the total factor variance.

Table 3

Factor Loadings for Varimax Solution for Year 1 (N=780)

	Factors				
Var.	1	2	3	4	Commun. Est.
A	-.0863	-.0585	.6918	-.0076	.4895
B	-.1482	-.1408	-.2978	.2952	.2176
C	-.7981	.0570	.0718	.0556	.6485
E	-.0047	.6954	.2020	.0870	.5319
F	-.0424	.4902	.5785	.0819	.5835
G	-.2272	-.2188	.1519	-.5985	.4808
H	-.4299	.4363	.5581	-.0903	.6947
I	.0477	-.3448	.4052	.5095	.5449
L	.5432	.4400	.0584	-.1563	.5165
M	-.2711	.0518	-.0874	.7026	.5774
N	.0058	-.5945	.0039	-.1981	.3927
O	.7405	-.1645	-.0516	-.0640	.5821
Q1	-.0378	.5882	-.1632	.0051	.3741
Q2	.0570	-.0168	-.6689	.1705	.4800
Q3	-.5323	-.2339	.0636	-.4712	.5641
Q4	.7917	-.0103	-.0729	.0616	.6360

The factors were named by an examination of the factor loadings. Each factor is described by its highest primary scale loadings. Scale loadings .40 and above were considered significant (Hair, Anderson, & Tatham, 1987).

Factor 1 accounted for 18.74% of the factor variance (eigenvalue 2.9978) and represented a dimension primarily characterized by anxiety. Factor 2 accounted for 14.22% of the factor variance (eigenvalue 2.2748) and represented a second-order dimension of independence. Factor 3 accounted for 11.02% of the factor variance (eigenvalue 1.7638) and represented a second-order dimension of extraversion. Factor 4 accounted for 7.99% of the factor variance (eigenvalue 1.2780) and represented a dimension primarily characterized by uncontrolled imaginativeness.

Factor Structure for Year 2 Sample. The factor loadings for the Varimax solution of the principal component method of factor analysis for pre-service teachers applying to the College in Year 2 are presented in Table 4. Using an eigenvalue of less than 1 as the criterion to stop factoring, five factors were extracted which accounted for 57.32% of the total factor variance.

Table 4

Factor Loadings for Varimax Solution for Year 2 (N=1015)

	Factors					
Var.	1	2	3	4	5	Comm. Est.
A	-.0918	.6581	-.0824	.1015	.1661	.4861
B	-.0162	-.1001	.1775	.0048	.6734	.4952
C	-.7601	.1889	.0621	.0920	.0371	.6271
E	.0772	.3028	.7126	-.0662	.0202	.6102
F	.0155	.7055	.3139	-.0738	-.0255	.6026
G	.0369	.1033	-.0309	.8296	-.0891	.7092
H	-.3379	.6642	.3393	.1058	.0317	.6826
I	.0738	.1405	-.3038	-.0344	.6927	.5985
L	.6381	.0948	.3544	.0721	-.0220	.5474
M	-.2933	-.0288	.1362	-.1948	.5517	.4477
N	.0916	-.0680	-.5216	.3348	.0147	.3974
O	.7483	-.0979	-.1081	-.0617	-.1252	.6007
Q1	-.0008	-.1262	.6312	.0495	.0670	.4213
Q2	.0674	-.7054	.1651	.0104	.2209	.5782
Q3	-.4042	-.0261	-.1017	.7000	-.0799	.6708
Q4	.8219	-.1116	-.0317	-.0878	.0120	.6969

Factor 1 accounted for 19.17% of the factor variance (eigenvalue 3.0672) and represented a dimension primarily characterized by anxiety. Factor 2 accounted for 13.55% of the factor variance (eigenvalue 2.1685) and represented a

second-order dimension of extraversion. Factor 3 accounted for 10.58% of the factor variance (eigenvalue 1.6924) and represented a second-order dimension of independence. Factor 4 accounted for 7.72% of the factor variance (eigenvalue 1.2347) and represented a dimension primarily characterized by superego strength. Factor 5 accounted for 6.31% of the factor variance (eigenvalue 1.0092) and represented a second-order dimension characterized by imaginativeness.

Factor Structure for Year 3 Sample. The factor loadings for the Varimax solution of the principal component method of factor analysis for pre-service teachers applying to the College in Year 3 are presented in Table 5. Using an eigenvalue of less than 1 as the criterion to stop factoring, five factors were extracted which accounted for 58.61% of the total factor variance.

Table 5

Factor Loadings for Varimax Solution for Year 3 (N=430)

Var.	Factors 1	2	3	4	5	Comm. Est.
A	-.0918	.6896	-.0835	.1729	.1184	.5349
B	-.0575	-.1000	.1083	.0018	.6122	.3998
C	-.7763	.0867	.0242	.1037	.0315	.6225
E	.0845	.3805	.7220	-.0107	.1678	.7015
F	.0068	.6857	.2689	-.2550	-.0125	.6078
G	-.0818	.1489	.0199	.7899	-.1044	.6642
H	-.3114	.6293	.3988	.1006	.1353	.6804
I	.0810	.1481	-.2109	.0301	.7091	.5767
L	.6379	.0148	.4176	.1122	.0003	.5941
M	-.3133	-.0173	.2238	-.2623	.5842	.5587
N	.0651	-.2118	-.2728	.4983	.1223	.3868
O	.7484	-.1372	-.1902	-.1216	-.0725	.6352
Q1	-.0179	-.1770	.6921	-.2051	-.0524	.5555
Q2	.0958	-.6951	.1375	.0098	.1857	.5459
Q3	-.4651	.0178	-.0506	.6594	-.1356	.6724
Q4	.7864	-.1047	.0481	-.0714	-.0721	.6420

Factor 1 accounted for 19.75% of the factor variance (eigenvalue 3.1596) and represented a dimension primarily characterized by anxiety. Factor 2 accounted for 14.57% of

the factor variance (eigenvalue 2.3312) and represented a second-order dimension of extraversion. Factor 3 accounted for 10.15% of the factor variance (eigenvalue 1.6239) and represented a second-order dimension of independence. Factor 4 accounted for 7.38% of the factor variance (eigenvalue 1.1802) and represented a dimension primarily characterized by superego strength. Factor 5 accounted for 6.77% of the factor variance (eigenvalue 1.0834) and represented a second-order dimension characterized by imaginativeness.

Results of the Factor Structure Comparisons: Years 1, 2, and 3. The results of Kaiser Factor Matching analyses for Years 1, 2, and 3 are found in Tables 6, 7, and 8. Table 6 presents the results of the comparison of the factor structure of Year 1 with the factor structure of Year 2. Cosines below .85 indicate dissimilarity, and cosines between .85 and .95 indicate high similarity (Galligman & Newman, 1983; Newman, 1971). As can be seen, there was a strong degree of similarity (cosines above .95) between four of the five second-order factors: Year 1 factors Anxiety, Independence, Extraversion, and Uncontrolled Imaginativeness, with Year 2 factors Anxiety, Independence, Extraversion, and Superego Strength. Year 2's fifth factor, Imaginativeness, was dissimilar to Year 1's factor space. The redundancy index between these two factor solutions was

.9931, indicating no practical difference between the factor structures.

Table 6

Results of Kaiser Factor Matching
Between Year 1 and Year 2

	Year 1			
Year 2	Anx.	Ext.	Indep.	U.Ima.
Anx.	.9961	.0250	-.0523	.0612
Ext.	-.0149	.9843	.1733	-.0015
Indep.	.0700	-.1685	.9535	-.2364
Super.	-.0415	-.0434	.2254	.9578
Ima.	.0309	-.0112	-.0857	-.1518

Table 7 presents the results of the comparison of the factor structure of Year 1 with the factor structure of Year 3. As can be seen, the results were similar to the results for the comparison of Years 1 and 2. There was a strong degree of similarity (cosines between .90 and .95) between three of the five second-order factors: Year 1 factors Anxiety, Independence, Extraversion, and Uncontrolled Imaginativeness, with Year 3 factors Anxiety, Independence, Extraversion, and Superego Strength. Year 3's fifth factor, Imaginativeness, was dissimilar to Year 1's factor space. The redundancy index between these two factor

solutions was .9946, indicating no practical difference between the factor structures.

Table 7

Results of Kaiser Factor Matching
Between Year 1 and Year 3

	Year 1			
Year 3	Anx.	Ext.	Indep.	U.Ima.
Anx.	.9944	-.0456	-.0254	.0839
Ext.	.0342	.9908	.0172	.1001
Indep.	.0356	-.0074	.9868	-.1496
Super.	-.0927	-.1203	.1245	.9190
Ima.	-.0108	-.0414	-.0988	-.3405

Table 8 presents the results of the comparison of the factor structure of Year 2 with the factor structure of Year 3. As can be seen, there was a strong degree of similarity (cosines above .95) between all five of the second-order factors: Year 2 factors Anxiety, Independence, Extraversion, Superego Strength, and Imaginativeness with Year 3 factors Anxiety, Independence, Extraversion, Superego Strength, and Imaginativeness. The redundancy index betweenthese two factor solutions was .9921, indicating no practical difference between their factor structures.

Table 8

Results of Kaiser Factor Matching
Between Year 2 and Year 3

Year 2

Year 3	Anx.	Ext.	Indep.	Super.	Ima.
Anx.	.9935	.0587	-.0241	-.0656	-.0685
Ext.	-.0596	.9812	.1698	-.0659	-.0207
Indep.	.0323	-.1715	.9820	-.0634	.0361
Super.	.0485	.0503	.0777	.9719	-.2109
Ima.	.0779	.0422	-.0177	.2067	.9742

Factor Stability: Males and Females

In order to discuss the results of the investigation of differences in the second-order factor structure of the 16 PF between male and female pre-service teachers, it is first necessary to discuss the results of the second-order factor analysis for these groups.

Factor Structure of the Male Sample. The factor loadings for the Varimax solution of the principal component method of factor analysis for male pre-service teachers are presented in Table 9. Using an eigenvalue of less than 1 as the criterion to stop factoring, four factors were extracted which accounted for 52.53% of the total factor variance.

Table 9

Factor Loadings for Varimax Solution for Males (N=568)

	Factors				
Var.	1	2	3	4	Commun. Est.
A	-.1353	-.1333	.6458	.0368	.4544
B	.0117	.1249	-.1065	.4833	.2606
C	-.7969	.0669	.1005	.0753	.6553
E	.0480	.6912	.1992	.0161	.5200
F	.0370	.5047	.5920	-.0458	.6087
G	-.2431	-.3186	.1966	-.4678	.4180
H	-.3350	.3318	.6709	-.0497	.6749
I	.0555	-.3166	.3096	.6264	.5915
L	.6564	.2837	.0662	-.1347	.5339
M	-.2557	.0685	-.0356	.7028	.5653
N	-.0004	-.6251	.0283	-.0474	.3938
O	.7275	-.2219	-.1347	-.0001	.5966
Q1	-.0123	.5556	-.1571	.1534	.3570
Q2	.0304	.0987	-.7213	.1214	.5456
Q3	-.5875	-.2945	.0882	-.3389	.5544
Q4	.8079	.0053	-.1465	-.0027	.6742

The factors were named by an examination of the factor loadings. Each factor is described by its highest

primary scale loadings. Scale loadings .40 and above were considered significant (Hair, Anderson, & Tatham, 1987).

Factor 1 accounted for 19.98% of the factor variance (eigenvalue 3.1976) and represented a dimension primarily characterized by anxiety. Factor 2 accounted for 13.79% of the factor variance (eigenvalue 2.2060) and represented a second-order dimension of independence. Factor 3 accounted for 10.67% of the factor variance (eigenvalue 1.7068) and represented a second-order dimension of extraversion. Factor 4 accounted for 8.09% of the factor variance (eigenvalue 1.2939) and represented a dimension primarily characterized by uncontrolled imaginativeness.

Factor Structure of the Female Sample. The factor loadings for the Varimax solution of the principal component method of factor analysis for female pre-service teachers are presented in Table 10. Using an eigenvalue of less than 1 as the criterion to stop factoring, four factors were extracted which accounted for 57.25% of the total factor variance.

Table 10

Factor Loadings for Varimax Solution for Females (N=1657)

	Factors					
Var.	1	2	3	4	5	Comm. Est.
A	-.0527	.6957	-.0858	.1222	.1590	.5344
B	-.0765	-.1608	.1667	.0239	.6016	.4219
C	-.7650	.1475	.0522	.1116	.0538	.6250
E	.0692	.3290	.7104	.0019	.0813	.6243
F	-.0244	.6851	.3362	-.1177	-.0417	.5986
G	.0153	.0834	-.0479	.8521	-.0654	.7398
H	-.3594	.6205	.3946	.1374	.0421	.6906
I	.1146	.2301	-.3073	-.0239	.6811	.6251
L	.6025	.0692	.4096	.0991	-.0228	.5459
M	-.2921	-.0509	.1958	-.2339	.5608	.4955
N	.0546	-.0879	-.5134	.2613	-.0637	.3466
O	.7441	-.0912	-.1276	-.0967	-.1315	.6049
Q1	-.0140	-.1350	.6341	.0171	.0023	.4209
Q2	.0909	-.6808	.0938	.0097	.2566	.5464
Q3	-.3914	-.0155	-.1363	.7020	-.0504	.6673
Q4	.8116	-.0919	-.0105	-.0743	.0030	.6728

Factor 1 accounted for 19.01% of the factor variance (eigenvalue 3.0415) and represented a dimension primarily characterized by anxiety. Factor 2 accounted for 13.95% of the factor variance (eigenvalue 2.2319) and

represented a second-order dimension of extraversion. Factor 3 accounted for 10.48% of the factor variance (eigenvalue 1.6766) and represented a second-order dimension of independence. Factor 4 accounted for 7.54% of the factor variance (eigenvalue 1.2058) and represented a dimension primarily characterized by superego strength. Factor 5 accounted for 6.28% of the factor variance (eigenvalue 1.0041) and represented a second-order dimension characterized by imaginativeness.

Results of the Factor Structure Comparisons: Males and Females. The results of the Kaiser factor-matching analysis for males and females is found in Table 11. This table presents the results of the comparison of the factor structure of males with the factor structure of females. As can be seen from examining Table 11, there was a strong degree of similarity (cosines between .85 and .95) between four of the five second-order factors: male sample factors Anxiety, Independence, Extraversion, and Uncontrolled Imaginativeness, with Female sample factors Anxiety, Independence, Extraversion, and Superego Strength. The females' fifth factor, Imaginativeness, was dissimilar to the male sample factor space. The redundancy index between these two factor solutions was .9936, indicating no practical difference between their factor structures.

Table 11

Results of Kaiser Factor Matching
Between Males and Females

Males

Fem.	Anx.	Ext.	Indep.	U.Ima.
Anx.	.9468	.3150	-.0616	.0092
Ext.	-.2976	.9312	.1997	.0670
Indep.	.1166	-.1658	.9693	-.0497
Super.	.0257	-.0780	.0671	.9611
Ima.	-.0288	-.0052	-.1104	.2632

DISCUSSION

Researchers of personality defined by the 16 PF have maintained that the personalities of men and women are different (Cattell, 1989; Cattell, 1973; IPAT, 1970, 1972). Separate norms and formulas have been developed for each gender due to evidence of mean differences between males and females (Cattell, 1989). However, recent research seems to indicate that their actual "personality structures" are similar (Krug & Johns, 1986; Miller & Krieshok, 1989). In regards to the personalities of teachers, Cattell (1973) and IPAT (1970) report separate profiles and norms for male and female in-service teachers. Unfortunately, little information on the personality of "pre-service" teachers is available. Consequently, this researcher sought to develop normative data and investigate the factor structure of male and female pre-service teachers. The findings of this study did not support separate profiles for male and female pre-service teachers at the primary factor level. Further, the personalities of cohorts of pre-service teachers appear to be stable from year to year, allowing data to be aggregated across time. Therefore, males and females share similar personality structures at the primary factor-level, and these structures appear to be stable from year to year.

Recent research into gender differences at the secondary factor level has supported the use of common formulas and equations for men and women (Krug & Johns, 1986; Miller & Krieshok, 1989). The results of the second-order factor solution comparison between male and female pre-service teachers in this study supports the use of a single factor structure for both genders, and the conclusion that men and women applying to the teacher education program share similar personality structures. However, a caveat is necessary. Females' fifth factor, Imaginativeness, is relatively unique to their factor solution. While this factor may appear in a limited sense as a component of the males' factor solution, males' Uncontrolled Imaginativeness factor is more strongly related to females' Superego Strength factor. Therefore, since males' imaginativeness appears to be less controlled and disciplined than females', imaginative tasks and processes may be conceptualized and/or operationalized differently by gender.

One should also note that the factor solutions obtained for this study did not correspond with the eight factor solution reported by IPAT (1970), Cattell (1973), Allen and Schuerger, and Reuter, Schuerger, and Wallbrown (1985). However, the results were more supportive of the "big five" factor solution (Barrick & Mount, 1991). Results were also somewhat similar to the five broad second-order factors utilized by Schuerger and Allen (1986) in their

analysis of the second-order factor structure common to five personality questionnaires. Furthermore, Zuckerman (1985) comments that in examining the 16 PF's factor pattern matrix, only four secondary factor scores are reliable across sex and have loadings on more than one of the primary factors.

In conclusion, the overall results of this study encourages the use of a common factor solution for men and women pre-service teachers at both the primary and secondary factor level. This should be helpful in advising of undergraduate pre-service teachers and in conducting further research projects with this population. To the extent that the factor structures are stable across groups, researchers and practitioners can interpret the factors with confidence (Foerstner, 1986).

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